

ARDUINO BASED LED STREET LIGHT AUTO INTENSITY CONTROL SYSTEM

Shreesh Mishra, Shivakant Gupta, Santosh Singh, Tripuresh Tiwari, Anand Mohan

Department of EN Students

Atul Kushwaha

Assistant Professor

Department EN

IMS Engineering College, Ghaziabad

ABSTRACT:

The main aim of this project is to utilize the application of the Arduino board to control the intensity of street light. As the traffic decreases slowly during late-night hours, the intensity gets reduced progressively till morning to save energy and so, the street lights switch on at the dusk and then switch off at the dawn, automatically. The process repeats every day.

White Light Emitting Diodes (LED) replaces conventional HID lamps in street lighting system to include dimming feature. The intensity is not possible to be controlled by the high intensity discharge (HID) lamp which is generally used in urban street lights. LED lights are the future of lighting, because of their low energy consumption and long life. LED lights are fast replacing conventional lights because intensity control is possible by the pulse width modulation.^[1]

This proposed system uses an Arduino board and a rectified-power supply. String of LED are interfaced to the Arduino board with a MOSFET device. The intensity control of the LED light is possible by varying duty cycle from a DC source. A programmed Arduino board is engaged to provide different intensities at different times of the night using PWM technique. This project is also enhanced by integrating the LDR to follow the switching operation precisely.

INTRODUCTION:

The main consideration in the field of technologies are Automation, Power consumption and cost effectiveness. Automation is intended to reduce man power with the help of intelligent systems, Power saving is the main consideration forever as the source of the power (Thermal, Hydro etc.) are getting diminished due to various reasons. The main objective of the project is to save electrical energy automatically used in street light by the application of power saving elements such as LDR. We want to save power automatically instead of doing manual, so it's easy to make cost effectiveness. This saved power can be used in some other applications, such as in irrigation, villages, towns and many other fields. We can design intelligent systems by using Arduino to control intensity of street lights.^[2]

The idea of designing a new system for the streetlight by using LED that do not consume huge amount of electricity and illuminate large areas with the highest intensity of light whenever required. Providing street lighting is one of the most important and expensive expenditure of electricity in a city. Lighting can account for 30-50% of the total energy bill in typical cities worldwide. Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. Inefficient lighting wastes significant financial resources every year, and poor lighting can cause accidents. Use of Energy efficient technologies can reduce cost of the street lighting drastically and also provide excellent efficiency.

TECHNIQUES USED IN ARDUINO:

Manual control is prone to errors and leads to energy wastages and manually dimming during midnight is impractical. In this paper two kinds of sensors will be used which are light sensor like LDR and photoelectric sensor. The light sensed will detect darkness to activate the ON/OFF switch, so the streetlights will be ready to turn on and the photoelectric sensor will detect movement to activate the streetlights. LDR, which varies according to the amount of light falling on its surface, this gives an inductions for whether it is a day or night. The photoelectric sensor will be activated only in the night. If any object crosses the photoelectric beam, a particular light will be automatically ON.

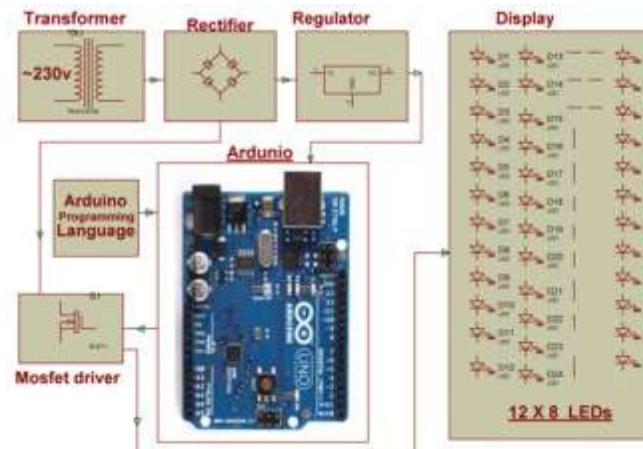
By using this as a basic principle, the intelligent system can be designed for the perfect usage of streetlights in any place. The lighting system consists of Arduino board, LDR, photoelectric sensor and other electrical equipments. By using the LDR we can operate the lights, i.e. when the light is available then it will be in the OFF state and when it is dark the light will be in ON state. It means LDR is inversely proportional to light, when the light falls on the LDR it sends the commands to the Arduino board that it should be in the OFF state then it switch OFF the light, the photoelectric sensor will be used to turn ON or OFF the light according to the presence or absence of the object. All these commands are sent to the controller then according to that the device operates. We use a mosfet switch as a relay to act as an ON/OFF switch.^[3]

NEED OF THE SYSTEM:

The traditional implementation and organization of street lighting have no possibilities for improving and development any more. The dynamic changes in economy, energy supplies and ecology on national, Indian and world like scale require an automatic, adequate modernization of street lighting. However, this would be possible only with a quite new functional conception which in fact means flexibility, automation, adaptability of street lighting. Simultaneous ensuring of the conditions of safe traffic and decreasing the energy consumption and operational costs could be realized in conformity with the constantly changing parameters of the environment.

In conformity with the 24 hours change of daylight, the highly changeable traffic, the variable meteorological conditions and some extreme situations on the roads, the intensity of street lighting should change in a dynamic manner.^[4]

BLOCK DIAGRAM OF ARDUINO BASED LED STREET LIGHT AUTO INTENSITY CONTROL:



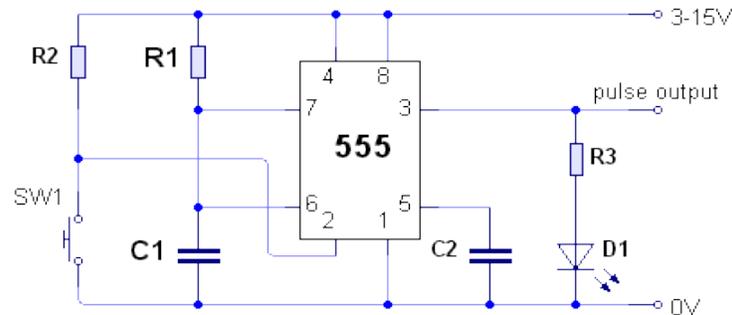
SYSTEM ARCHITECTURE:

Technical devices and methods that are enhanced by technical progress will be necessary for the realization of adaptive lighting. The tender documentation states the goals of the E-street Project and the smart ways of their future implementation. It describes the system structure and the technical requirements towards its

- It cannot be used in all outdoor applications.

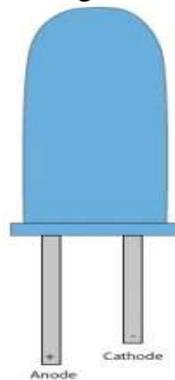
555 Timers IC:

The **555 timer IC** is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide up to four timing circuits in one package. Introduced in 1971 by American company Signetics, the 555 ICs are still in widespread use due to its low price, ease of use, and stability. [7]



INFRARED LED:

An IR LED, also known as IR transmitter, is a special purpose LED that transmits infrared rays in the range of 760 nm wavelength. Such LEDs are usually made of gallium arsenide or aluminum gallium arsenide. They, along with IR receivers, are commonly used as sensors. Its appearance is the same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify whether the IR LED is working or not, unlike a common LED. To overcome this problem, the camera on a cell phone can be used. The camera can show us the IR rays being emanated from the IR LED in a circuit. [8]



CONCLUSION:

This paper elaborates the design and construction of Arduino based LED street light auto intensity control system circuit. The circuit works properly to turn street light LED ON/OFF. After designing the circuit which controls the intensity of street light as illustrated in the previous sections, LDR sensor and photoelectric sensors are the two main components working in the circuit. If the two conditions have been satisfied, the circuit will do the desired work according to a specific program. Each sensor controls the turning ON or OFF of the lighting column of street light. The intensity of street lights has been successfully controlled by the Arduino board. Street lights are a large consumer of energy for cities, using up to 30-50% of the energy budget. If every city installs the proposed system, then a lot of power can be saved. The proposed system is a power-saving mechanism for LED street lights by using an Arduino Board. It turns out to be the most reliable and time-efficient way to

switch ON/OFF street-lights. It provides an effective measure to save energy by preventing unnecessary wastage of electricity, caused due to manual switching or lighting of street-lights when it is not required. It adopts a dynamic control methodology for traffic flow. The proposed system is especially appropriate for street lighting in remote urban and rural areas where the traffic is low at times. The system is versatile, extendable and totally adjustable to user needs.^[9]

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